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Note

Cubic Graphs on ⩽14 Vertices

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The aim of the present note is the announcement of the results of our "Computer investigation of cubic graphs," T.H. Report 76-wsk-01, Department of Mathematics, Technological University Eindhoven.

A cubic graph is a regular graph of valency 3. Let $N(n)$ denote the number of the nonisomorphic connected cubic graphs on n vertices. By means of a computer search we have (cf. [1]) determined $N(n)$ for $n \leqslant 14$ as follows:

n	4	6	8	10	12	14
$N(n)$	1	2	5	19	85	509

.

For each such graph the following data are computed:

(i) its description by means of its edges and, for $n \leqslant 12$, by a drawing;
(ii) the eigenvalues of its adjacency matrix;
(iii) the numbers of its circuits of length 3, 4,..., n;
(iv) its diameter, connectivity, and planarity;
(v) the order of its automorphism group.

Some statistics concerning graphs having various properties are included. Certain errors in the literature are corrected.

The graphs are ordered lexicographically according to their eigenvalues in nonincreasing order. We feel that such an ordering is a very natural one. This idea is supported by the behavior of the second largest eigenvalue λ_2.

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Indeed, decreasing λ_2 shows graphs of more "round" shape (smaller diameter, higher connectivity, and girth).

The present search is motivated by the importance of cubic graphs in graph theory, by the search for cospectral cubic graphs (we found 3 pairs on 14 vertices), and also by the fact that cubic graphs represent a nontrivial class of graphs which still has a reasonably small cardinality.

Note added in proof. Meanwhile, the following came to our attention:

I. A. Faradžev, Constructive enumeration of regular graphs (Russian), *Uspehi Mat. Nauk* **31** (1976), 246.

I. A. Faradžev, Constructive enumeration of combinatorial objects, manuscript.

These papers contain a.o. the announcement of N(16) = 4060, N(18) = 4130, (notice the misprint in the first paper).

REFERENCE

1. F. C. BUSSEMAKER, S. ČOBELJIĆ, D. M. CVETKOVIĆ, AND J. J. SEIDEL, "Computer Investigation of Cubic Graphs," T.H. Report 76-WSK-01, Department of Mathematics, Technological University Eindhoven, The Netherlands.